Translation

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

23 SEP 2004

Applicant's or agent's file reference 2002P04668WO	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/DE2003/000793	International filing date (*day/month/year*) 12 March 2003 (12.03.2003)	Priority date (*day/month/year*) 26 March 2002 (26.03.2002)
International Patent Classification (IPC) or national classification and IPC G05B 13/02		
Applicant SIEMENS AKTIENGESELLSCHAFT		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
06 August 2003 (06.08.2003)	11 March 2004 (11.03.2004)
Name and mailing address of the IPEA/EP Facsimile No.	Authorized officer Telephone No.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International Application No.
PCT/DE2003/000793

I. Basis of the report

1. With regard to the **elements** of the international application:*

☐ the international application as originally filed

☒ the description:
pages 1-17, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☒ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement under Article 19
pages _____, filed with the demand
pages 1-8, filed with the letter of 12 December 2003 (12.12.2003)

☒ the drawings:
pages 1/2-2/2, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

INTERNATIONAL PRELIMI[redacted]Y EXAMINATION REPORT

International application No.
PCT/D[redacted]3/00793

V. **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-8	YES
	Claims		NO
Inventive step (IS)	Claims	1-8	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-8	YES
	Claims		NO

2. Citations and explanations

1. PCT Article 33(2) and (3)

The admissible amendment of claim 1 as originally filed incorporates the features of claim 3 as originally filed, yielding the subject matter of the new claim 1. This claim therefore has the following further features not found in claim 1 as originally filed:

- reduction of the amplification factor (Kp) whenever the time curve of the actual value (I) has a residence time (T11), during which the actual value (I) assumes a value within the tolerance range, that is shorter than a first specified time period (T1).

This feature, in combination with the other features of the new claim 1, is neither known from nor suggested by the search report citations. In this respect the subject matter of the new claim 1 appears to be novel and inventive. The independent device claim, claim 5, describes a controller which is defined by device features and which operates according to the method defined in claim 1. The subject matter of claim 5 therefore also appears to satisfy the requirements for novelty and inventive step.

Patent claims

1. Method for controlling at least one component of a technical plant by means of a PI controller that as control parameters has a control ratio (Kp) and an integral-action time (Tn), characterized by the following steps:

a) the integral-action time (Tn) is defined,

b) an initial value (Kp0) of the control ratio (Kp) is defined,

c) at least one set value (S) of a control quantity of the component is defined and

d) during operation of the technical plant, the actual value (I) of the controlled variable is determined and the control ratio (Kp) is changed relative to the time response of the actual value (I) until the actual value (I) of the control variable remains within a tolerance band (Tb) relative to the set value (S), with the control ratio (Kp) being reduced if the time response of the actual value (I) has a dwell time (T11) during which the actual value (I) has a value within the tolerance band that is smaller than a first defined time period (T1).

2. Method in accordance with claim 1, characterized in that the integral-action time (Tn) is determined from the system time constants (K1, K2, ..., K3), particularly from the sum of the system time constants of the component to be controlled.

3. Method in accordance with claim 1 or 2, characterized in that in step d) the control ratio (Kp) is only reduced if additionally a first change rate (v1) of the actual value (I) is greater than a second change rate (v2) of the set value (S0).

4. Method in accordance with one of claims 1 to 3, characterized in that in step d) the control ratio (Kp) is increased if the time response of the actual value (I) has a rise time (T22) that includes the period from the start of a change of the set value (S) up until reaching an instantaneous value of the actual value (I) within the tolerance band that is greater than a second defined time period (T2).

5. Controller (R) for controlling at least one component of a technical plant, that is designed as a PI controller and as control parameters has a control ratio (Kp) and an integral-action time (Tn), characterized by

- a first controller input (E1) by means of which the controller (R) can be supplied with a defined value for the integral-action time (Tn),
- a second controller input (E2) by means of which the controller (R) can be supplied with the control ratio (Kp),
- a third controller input (E3) by means of which the controller (R) can be supplied with a set value (S) of a control quantity of the component, and
- an adaption unit (A) that during the operation of the technical plant constantly applies the actual value (I) of the control variable (U) and by means of which the control ratio (Kp) can be constantly changed relative to the time response of the actual value (I), until the actual value (I) of the control variable remains within a tolerance band (Tb) relative to the set value (S), with the control ratio (Kp) being reduced by means of the adaption unit (A) if the time response of the actual value (I) has a dwell time (T11) during which the actual value (I) assumes a value within the tolerance band that is smaller than a first defined time period (T1).

6. Controller in accordance with claim 5, characterized in that the integral-action time (Tn) is determined from system time constants (K1, K2, ..., K3), in particular from the sum of the system time constants of the component to be controlled.

7. Controller in accordance with claim 5 or 6, characterized in that the control ratio (Kp) is then only reduced by the adaption unit (A) if additionally a first change rate (v1) of the actual value (I) is greater than a second change rate (v2) of the set value (S).

8. Controller in accordance with one of claims 5 to 7, characterized in that the control ratio (Kp) is increased by the adaption unit (A) if the time response of the actual value (I) has a rise time (T22), that includes the time period from the start of a change of the set value (S) until achievement of an instantaneous value of the actual value (I) within the tolerance band, that is greater than a second defined time period (T2).